IN THE SPECIFICATION

Please amend the Substitute Specification filed on May 7, 2004 as follows.

1. Please amend paragraph [0018] in the Substitute Specification as follows:

[0018] The power output of a VCSEL is given by:

$$P_O=(I-I_{th}) \boxminus \cdot \eta, \text{ and}$$

$$P_{avg}=(I_{avg}-I_{th}) \boxminus \cdot \eta.$$

Assuming that two samples of average power $P_{avg}(T_1)$ and $P_{avg}(T_2)$ are taken, and further assuming that the threshold current I_{th} and slope efficiency η remain constant across those measurements, the expression above for average power may be written as:

$$P_{avg}(T_1)=(I_{avg}(T_1)-I_{th})\cdot\eta, \text{ and}$$

$$P_{avg}(T_2)=(I_{avg}(T_2)-I_{th})\cdot\eta.$$

Solving these equations for the two desired variables:

$$I_{th}=\frac{P_{avg}(T_1)\cdot I_{avg}(T_2)-P_{avg}(T_2)\cdot I_{avg}(T_1)}{P_{avg}(T_1)-P_{avg}(T_2)}, \qquad (1)$$

$$\eta=\frac{P_{avg}(T_1)-P_{avg}(T_2)}{I_{avg}(T_1)-I_{avg}(T_2)}. \qquad (2)$$

The average power and average current will depend on the logical data value being transmitted at times T_1 and T_2. The exemplary embodiment of the present invention utilizes equations (1) and (2) above in real time control of both the average power and extinction ratio. Since average power

monitoring is being performed in real time, with the results fed back to control the bias current I_{bias} and modulation current I_{mod}, by using two appropriate samples of average power one parameter (e.g., slope efficiency) may be very closely approximated while the other parameter (threshold current in this example) is precisely known from the two measurements.

2. Please insert the following five paragraphs after paragraph [0025] in the Substitute Specification:

[0025.1] FIGURE 4 is a high level flowchart illustrating a process of controlling optical modulation amplitude and/or extinction ratio for an optical sub-assembly according to one embodiment of the present invention. In the example depicted and described, average power is controlled by varying I_l and extinction ratio is controlled by varying I_{mod}. In an alternative embodiment, the dependence of optical modulation amplitude on the modulation current I_{mod} could be determined from the equations given above, and controlled in lieu of extinction ratio.

[0025.2] The process 400 begins by initialization of $I_l = I_{l,min}$, $I_{mod}=0$ and $I_{th} = I_{th,min}$ (step 401). Next, an average output power sample $P_{avg}(N)$ is determined (step 402) from, for example, electrical characteristics of the VCSEL or the output signal from a low bandwidth monitor diode. The average power measurement $P_{avg}(N)$ is compared to a target value P_{target} to determine if the average power measurement is less than the target (step 403). If so, the present logical 1 level current I_l (the maximum current driven through the VCSEL) is incremented (step 404), provided the maximum operating limit set for that parameter $I_{l,max}$ (e.g., the maximum current that the VCSEL can tolerate) has not previously been reached. If not, however, the average power measurement $P_{avg}(N)$ is compared to a target value P_{target} to determine if the average power measurement exceeds or is greater than the target (step 405). If so, the logical 1 level current I_l is decremented (step 406), provided the minimum operating limit set for that parameter $I_{l,min}$ has not previously been reached.

[0025.3] If the average power measurement $P_{avg}(N)$ is neither less than nor greater than the target (i.e., the average power measurement $P_{avg}(N)$ equals the target value), the extinction ratio may be presumed to have been set to an acceptable value in a previous iteration of the process such that no further adjustment is required, and the process returns to step 402. Note that this may also be the case when the average power measurement $P_{avg}(N)$ does not equal the target value, but the logical 1 level current I_1 cannot be adjusted (i.e., I_1 has already reached $I_{1,max}$ or $I_{1,min}$).

[0025.4] On the other hand, if the logical 1 level current I_1 is incremented or decremented, the modulation current I_{mod} is altered to achieve (in this example) the desired extinction ratio (step 407). For this purpose, it may be noted that:

$$ER = 10 \cdot \log_{10}\left(\frac{P_1}{P_0}\right),$$

$$\Rightarrow ER = 10 \cdot \log_{10}\left(\frac{I_1(N) - I_{th}(N)}{I_1(N) - I_{\text{mod}}(N) - I_{th}(N)}\right)$$

so that, using the desired extinction ratio value and the threshold current estimate from the previous loop cycle, the modulation current may be set by:

$$I_{\text{mod}}(N) \approx (1 - 10^{-ER/10}) \cdot (I_1(N) - I_{th}(N-1)).$$

[0025.5] Finally, before proceeding with the next loop iteration (i.e., returning to step 402), the estimated threshold current I_{th} is calculated for use in the next iteration (step 408).